

Results: Patients with postoperative complications had significantly higher serum IL-6 levels already 3 hours after termination of CPB. These elevated serum levels were significant until third postoperative day.

Patients who suffered from capillary leak syndrome had significantly higher TNF-receptor levels pre- and postoperatively than patients without capillary leak syndrome.

Higher levels of IL-6 were found in patients developing infectious complication 24 hours prior to clinical symptoms.

Conclusion: IL-6 and TNF-receptor levels are potential prognostic markers for postoperative complications after cardiopulmonary bypass in children undergoing head surgery. Rapid methods for measurements makes them a suitable diagnostic tool with therapeutic consequences.

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The arterial switch operation twenty years later

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Background: The aim of our study was to evaluate incidence and severity of long term sequelae after arterial switch operation (ASO) for transposition of the great arteries (TGA).

Methods: We studied 99 consecutive pts who survived the ASO between 1977 and 1996. 65 pts had simple TGA, 34 pts had associated VSD and 11 had coarctation. A standard study protocol including serial ECG, echocardiography, and Holter was performed. Catheterisation or MRI were performed when indicated.

Results: 95 pts are in NYHA class 1, needing no medication. 1 pt died 14 years after ASO from pulmonary hypertension. 3 pts survived perioperative myocardial infarctions (M1); all had left coronary artery occlusion. All 3 have impaired LV function, but only 1 has symptoms and has had implantation of a defibrillator. Two pts have symptoms from aortic insufficiency, 38 reinterventions were performed in 24 pts, 33 for pulmonary stenosis, 2 for aortic stenosis, 2 for recoarctation and 1 for aortic insufficiency. Mean freedom from reintervention was 14 years (95% CI 12.3 - 15.6y). 24 reinterventions were surgical, and 14 were balloon dilations. Pulmonary stenosis was the most frequent complication, present in 23% of patients. LV dysfunction was seen in 7 pts and dysrhythmia in 10 pts, of whom 8 have no symptoms. Apart from the three pts with MI, no coronary obstruction was found in 40 pts who had angiography.

Conclusion: At follow-up after ASO, the overwhelming majority of pts are in NYHA class 1. Pulmonary stenosis remains the most important late complication, and is only partially avoidable with improved surgical technique.

Imaging

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Cerebral emboli during paediatric cardiac catheterization: a transcranial Doppler ultrasound study

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The aim of the study was to evaluate the frequency and causes of cerebral embolism in children undergoing catheterization procedures. Transcranial Doppler ultrasonography of the left middle cerebral artery was performed in 15 children (age range 1 day - 15

years) undergoing elective (N=13) or emergency (N=2) diagnostic or interventional catheterization. In patients with a R-L shunt (N=10) cerebral emboli, appearing as high intensity transient signals were recorded during all phases of the catheterization procedure including insertion of the venous catheter, catheter flushing, use of guidewires, reinjection of excess blood and injection of contrast medium by hand or power injector. In patients without a R-L shunt embolic phenomena were only detected during injections and manipulations in the arterial phase of catheterization, and only when the catheter was upstream of the left carotid artery. The median number of emboli was 130/procedure (range 19-530). Emboli were differentiated as gaseous (occurring in conjunction with injection of contrast medium) or solid (occurring during catheter and guidewire manipulations and reinjection of blood) from their different characteristics. Gaseous emboli presented as very shortlasting signals (<0.15 seconds) with an amplitude of >30dB compared to the background signal; solid emboli signals were longer lasting (>0.24 seconds) and had a relative amplitude of >30dB. All procedures were uneventful and none of the patients had any neurologic sequelae. Cerebral emboli occur frequently in paediatric catheterization procedures.

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Assessment of straddling atrioventricular valves by transthoracic 3-dimensional echocardiography

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We evaluated whether 3 dimensional (3D) echocardiography provides additional information over conventional cross-sectional echocardiography or angiography in the diagnosis of overriding or straddling atrioventricular valves. We studied 7 patients, aged from 1 month to 9.2 years, with 3D echocardiography. All but three had discordant ventriculoarterial connections or double outlet right ventricle. Data suitable for reconstruction were acquired with transthoracic echocardiography using parallel or rotational scanning with electrocardiographic and respiration gating. Right and left ventricular volumes were calculated in the reconstructed dataset. Anatomic findings from the 3D dataset were compared to findings at surgery. 3D echo provided images capable of defining the exact degree of straddling by imaging the proportion of tension apparatus being attached to the wrong side of the ventricular septum and could display the atrioventricular junction 'en face', allowing identification of the precise insertion of the muscular ventricular septum relative to the atrioventricular junction. In addition, cavity size could be accurately determined. An average right ventricular enddiastolic volume of 85.2 (73-95)% of normal was found in cases with straddling of the tricuspid valve and an average left enddiastolic volume of 71 (40-97)% of normal in cases with straddling of the mitral valve. We conclude that 3D echo can aid in surgical planning as it offers diagnostic information superior to 2D echo in studying the anatomy of straddling AV valves.

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Pulmonary artery imaging in children by contrast enhanced magnetic resonance angiography (ceMRA)

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Feasibility and clinical implication of recently developed ceMRA was tested for assessment of pulmonary artery anatomy in children. Eleven children (median age 4.5 yrs (1-9 yrs) underwent ceMRA in a 1.5 T Siemens Magnetom Vision System. Two patients had normal pulmonary arteries (PA), 3 pts hypoplastic PA, 2 pts at least one main branch stenosis and 3 pts had bidirectional cavopulmonary anastomosis. In all pts conventional cine angiography was carried out within 3 weeks before MR study.

Initially contrast bolus tracking was performed to analyze the time of optimal vascular enhancement. ceMRA was performed using 0.2 ml Gadolinium-DTPA/kg body weight via a peripheral venous line.

Ultrafast 3-dimensional Turbo Flash sequences without ECG trigger were used achieving scan times of 20 - 30 seconds. Effective slice thickness was 1.0-1.5 mm and scans were carried out under breath hold in cooperative pts (5/11). Maximum intensity projections (MIP) were calculated for 3-dimensional views.

PA could be visualized by ceMRA in 10/11 pts. Scans during continues breathing were only slightly reduced in quality compared to scans under breath hold. Cavopulmonary anastomosis, size and shape of normal PA and PA-stenosis were correctly 'Imaged by ceMRA, when compared to conventional angiography. In 1 pt with hypoplastic PA and severely reduced PA perfusion vascular contrast was inadequate. MIPs demonstrated full vascular pathology in only 5/8 pts, whereas sectional angiograms did in all.

ceMRA delivers excellent vascular contrast in pulmonary arteries by peripheral injection of small volumes of Gadolinium-DTPA. It can be performed in even small children without breath hold. Provided reasonable pulmonary artery perfusion, pulmonary artery morphology by ceMRA is comparable to conventional pulmonary angiograms.

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Comparison of stress echocardiography with perfusion scan to evaluate segmental myocardial contractility after complicated Kawasaki disease

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Between July 1979 and November 1993, 429 patients (P) were diagnosed with KD, 69 (16.1%) developed AN, persistent (7.91+4.04 yrs after acute KD) in 18(26%). Of these, 13(72%) were evaluated (age 14.3±4.4 yrs). Evaluation included baseline and exercise cardiac Tc-99m sestamibi-scan (MIBI) and stress echocardiography (SE) performed by a team unaware of degree of coronary lesion or results of perfusion scan. Maximal heart rate 180 to 200 bpm was attained. Post-exercise echo was done within 1:54±0:18 (1:20-2:30) minutes. MIBI revealed anomalies at rest in all P mostly inferior and septal. With exercise, perfusion returned to normal in 3, improved in 3, remained unchanged in 4 and worsened in 3. With echo focal hypokinesis was detected at rest in 7 P(54%): 6 segments in 1 with previous infarction, and 1 or 2 segments in 6; mild to severe in the first P (with posterior wall aneurysm), mild in 5 and moderate in 1. With exercise, 10 P(77%) had abnormal contractility: additional contiguous hypokinetic segments appeared in 3, 3 had no change, 1 improved and although normal at rest, 3 P demonstrated moderate to severe hypokinesis (2-3 segments). Echo anomalies correlated with localization but not severity of perfusion defect. Improved segmental perfusion with exercise did not necessarily predict enhanced contractility, it

even decreased in 2 P. In 3 P however a low myocardial flow reserve was coupled with exercise related segmental hypocontractility. In conclusion, the poor correlation between these 2 techniques is partly due to a lower sensitivity of resting echo in detecting segmental defect. The use of both studies appears warranted before clinical decision making in severe KD.

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Application of a low cost telemedicine link to the diagnosis of neonatal congenital heart defects by remote consultation

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Objective: To determine whether accurate remote diagnosis of congenital heart disease (CHD) could be achieved from echocardiographic images transmitted using a low-cost Telemedicine system
Design: 'Live' transmission of echocardiographic images via a Telemedicine link across two Integrated Service Digital Network (ISDN) lines.

Echocardiographic images obtained by a Paediatrician from newborn infants suspected of having CHD and transmitted to a regional Paediatric Cardiology unit for interpretation by a Consultant Paediatric Cardiologist. Verification of 'Tele-echo' diagnosis by follow-up direct consultation and echocardiography by Consultant Paediatric Cardiologist.

Setting: Neonatal unit of Altnagelvin Hospital, Londonderry, (a district general hospital) and The Regional Paediatric Cardiology Department, Royal Belfast Hospital For Sick Children.

Main outcome measures: 1. Accuracy of the diagnosis made using the Telemedicine Link. 2. Impact on patient management.

Results: Echocardiographic images were transmitted on 63 patients. A diagnosis was made in 61(97%) (transmitted images unsatisfactory in 2). CHD was diagnosed in 42(67%) patients. Fourteen patients (22%) with major CHD were accurately diagnosed within 24 hours of admission using the Telemedicine link and were transferred to the Regional Paediatric Cardiology Unit. A further 28 (44%) with less serious CHD continued to be managed at The District General Hospital and CHD was excluded in 19(30%). Follow-up consultation confirmed accurate diagnosis or exclusion of CHD in 57(90%). There were four (6.7%) false negatives (3 undetected small ventricular septal defects and one pulmonary stenosis).

Conclusion: Transmitted images were of sufficient quality to allow confirmation or exclusion of major CHD. The use of the Telemedicine link facilitated early diagnosis and initiation of appropriate management in those patients with major CHD and avoided the need for transfer in those patients where CHD was excluded.

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Coronary flow reserve assessed by positron emission tomography (PET) in children with TGA after anatomical correction

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Children after anatomical correction of TGA are subsequently